**Number:** Counting and Numeration 2

**2. The Great Escape**

This task requires students to apply their understanding of counting in a problem-solving context. While the explicit focus is on counting sets, students also need to use their understanding of number and operations.

**Focus Skills:**

* *Applying and problem-solving*: Select appropriate materials and processes for mathematical tasks and applications.
* *Communicating and expressing*: Listen to and discuss other children’s mathematical descriptions and explanations.
* *Reasoning*: Make guesses and carry out experiments to test them.

**Teaching Points:**

* Encourage students to spend time discussing the problems, ideally with a partner or in a small group. Ask questions to help them find a starting point – *What is the first thing you are going to try? What information is important?*
* To solve Part A, students need to find three numbers that total 7 and match the clues provided. Support students in using the ‘Try It’ (trial and improvement) strategy by encouraging them to test their guesses – *How will you know you have found the correct answer?*
* Encourage students to use concrete materials or draw the animals to help them explore different combinations. For example, cubes could be used to represent the sheep.
* Some students may benefit from a sorting ring template.
* If students are struggling with three unknown values in Part A, alter the problem so that there are only two unknown values. Eliminate the house and the second clue. Tell them that some sheep are in the barn, and some are in the field, and that the barn has 1 more sheep than the field.
* In Part B, encourage students to find as many possible answers as they can. Support them to make connections with what they already know, for example: the story of 10 and partitioning a number.

**Anticipated Student Responses:**

|  |  |
| --- | --- |
| **Part A** | **Part B** |
| Students can use trial and improvement to approach this problem, trying different combinations of three numbers that will total 7. For example:   * 2 (barn) + 2 (field) + 3 (house) = 7   This doesn’t work as the barn should have 1 more sheep than the field, so they could improve it to:   * 3 (barn) + 2 (field) + 2 (house) = 7   This doesn’t work as the field should have 3 sheep fewer than the house, so they could improve it to:   * **2 (barn) + 1 (field) + 4 (house) = 7**   This fits both clues so must be the correct answer.  Some students may work logically through the problem, for example:   * There must be at least 1 sheep in the barn, field and house:  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | barn | I | field | I | house | I |  * The barn has 1 more sheep than the field so there must be at least 2 sheep in the barn:  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | barn | II | field | I | house | I |  * The field has 3 sheep fewer than the house so there must be at least 4 sheep in the house:  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | barn | II | field | I | house | IIII |  * The total number of sheep now equals 7 so this must be the correct answer. | The solutions will represent the story of 10.   |  |  | | --- | --- | | 0 + 10 | 10 + 0 | | 1 + 9 | 9 + 1 | | 2 + 8 | 8 + 2 | | 3 + 7 | 7 + 3 | | 4 + 6 | 6 + 4 | | 5 + 5 |  | |
| **Extension** | |
| Farmer Rosie now has 11 (10 + 1) pigs and 3 (2 + 1) pens.  Below are some possible arrangements of the 11 pigs in the 3 pens. Encourage students to come up with interesting number stories.   |  |  |  |  | | --- | --- | --- | --- | | 0 + 10 + 1 | 10 + 0 + 1 | 1 + 1 + 9 | 2 + 3 + 6 | | 1 + 9 + 1 | 9 + 1 + 1 | 2 + 2 + 7 | 2 + 4 + 5 | | 2 + 8 + 1 | 8 + 2 + 1 | 3 + 3 + 5 | 2 + 5 + 4 | | 3 + 7 + 1 | 7 + 3 + 1 | 4 + 4 + 3 |  | | 4 + 6 + 1 | 6 + 4 + 1 |  |  | | 5 + 5 + 1 |  |  |  | | |

**Algebra:** Extending and Using Patterns

**19. Create a Rainbow**

This task encourages students to apply their understanding of number pattern in a problem-solving context. Students examine a 100-square and apply their knowledge of number to solve the number pattern problem; this may include counting on, counting backwards, addition and/or subtraction.

**Focus Skills:**

* *Communicating and expressing*: Discuss problems presented pictorially or orally.
* *Integrating and connecting*: Carry out mathematical activities that involve other areas of the curriculum.
* *Reasoning*: Recognise and create mathematical patterns and relationships.

**Teaching Points:**

* Ask students to look at the image on page 42 and begin with the questions such as – *What do you notice*?; *What do you think we have to do today*? Encourage them to come up with a few possible answers.
* Encourage students to spend time thinking about the problem. Ask them to identify things that might help them to solve the problem.
* Some students may choose to fill in the blank squares on the 100-square row by row rather than colour by colour in order to solve the problem.
* Encouraging students to recognise and explain the number pattern they are working on will help their confidence in using 100-squares.
* As students work, encourage them to explain why they think their answers are correct. They can support their explanation by showcasing their counting skills or by illustrating their understanding of place value.
* Provide a completed 100-square to students who are struggling to fill in the missing squares so they can compare. Ask them to read their solutions aloud in context with the other numbers – *Does that make sense?* *How do you know?*
* The language and descriptions students use in the Maths Talk aspect of the lesson may differ depending on their understanding. Encourage them to explain what they see as best as they can. They may notice some of the following patterns on the 100-square or in the rainbow colours:
* Increasing units by 1 for all rainbow colours: 1, 2, 3, 4, 5, 6, 7, 8, 9
* Decreasing tens in the beginning of the rainbow colours but then increasing tens: 71, 62, 53, 44, 35, 36, 47, 58, 69, 80
* The numbers on the 100-square increase by 1 when you read them left to right, in a row.
* The numbers on the 100-square increase by 10 when you read them in a column, from top to bottom and left to right, in a row.
* The numbers in the first column all end in 1, the numbers in the second column all end in 2, etc.
* For Part B, encourage students to keep their pattern picture simple to avoid requiring help or to avoid any frustration with how the image turns out. As well as this, a simple picture will help to keep the focus on the numbers rather than the execution of their picture. Explain to students that they can create a simple pattern if struggling to think of a picture. Ideas for pictures may include robots, cars, balloons, house, flower, boat, people.
* Ask questions about student’s emerging pictures. This will encourage them to think about the numbers on the 100-square as well as give them the opportunity to read the numbers aloud. Questions could include – *Which is the smallest number which you shaded green?; Which number is one square above 76?*
* The extension might involve students writing out their instructions in their copy book or on a piece of paper to give to a partner to follow. They can use the 100-squares on page 72 to re-create their partner’s 100-square pattern.

**Anticipated Student Responses:**

|  |  |
| --- | --- |
| **Part A** | **Part B** |
| Red: 71, 62, 53, 44, 35, 36, 47, 58, 69, 80  Orange: 81, 72, 63, 54, 45, 46, 57, 68, 79, 90  Yellow: 91, 82, 73, 64, 55, 56, 67, 78, 89, 100  Green: 92, 83, 74, 65, 66, 77, 88, 99  Blue: 93, 84, 75, 76, 87, 98  Purple: 94, 85, 86, 97  Pink: 95, 96 | Student’s choice. |
| **Extension** | |
| Students can share their number instructions with a partner. | |

**Shape and Space:** 3D Shapes

**22. Construction Challenge**

The aim of this task is to encourage students to use their understanding of 3D shapes and spatial awareness in a problem-solving context. Students are tasked with recreating pictorial representations of 3D structures with interlocking cubes to identify how many cubes are needed to construct them.

**Focus Skills:**

* *Communicating and expressing*: Discuss problems presented pictorially or orally.
* *Integrating and connecting*: Recognise the relationship between verbal, concrete, pictorial and symbolic modes of representing numbers.
* *Reasoning*: Justify the processes and results of mathematical activities.

**Teaching Points:**

* Explore the shapes presented visually on page 48. Discuss with the class – *What do you notice? What is the same and different about these shapes*?
* In Part A, students are asked to use interlocking cubes to build each of the shapes. Encourage them to think about how many cubes they will need and how they will know they are correct.
* Some students will be able to create their shapes with ease. Others may need guidance. Encourage them to check how many cubes are in a row or a column. Some students will use one-to-one correspondence to follow the pattern of the shape they are trying to recreate. Encourage them to explain how they built their shapes.
* Encourage students to explain how they got their answers. Some students may not count the cubes they cannot see. Encourage them to explore this idea further – *I wonder are there any cubes we can’t see?*
* It is worth noting that some students may reason that it is possible to build these shapes without the cubes they cannot see as they are creating them with interlocking cubes and therefore, can add the 3rd and 4th row without a foundation. However, the stability of these shapes may be in jeopardy. Encourage students to test this – *Do they need the cubes they can’t see to build these shapes?* Accept both answers, as the task simply asks them to build these shapes.
* In Parts B and C, students are encouraged to build a big cube. Some students may use their counting skills find the answers. Encourage students to reason their answers are correct, for example – *The top row of the big cube has 9 cubes, and I can see there are 3 rows of the same number of cubes. The shape is 3 cubes and so is my big cube.*
* It might be an idea for students to use one colour to build the original shapes from Part A and use a new, single colour to continue to build the shapes into a big cube. This will help with confusion of how many more small cubes were used.
* It is possible to make the shapes using a selection of cube colours. However, encourage students to discuss how they will record how many more cubes they need for each shape. They may decide to keep tally of cubes to help find their answers, for example.
* For the extension, ask students to make a 3D shape using, for example, 14 small cubes or 18 small cubes and write instructions for how to build it. If students finish quickly, further extension could include – *How many more cubes would you need to make a big cube?*

**Anticipated Student Responses:**

|  |  |
| --- | --- |
| **Part A** | **Part B** |
| Shape 1: 9 cubes  Shape 2: 12 cubes (9 cubes)  Shape 3: 15 cubes (13 cubes) | 27 cubes |
| **Part C** | |
| Shape 1: 18 cubes  Shape 2: 15 cubes  Shape 3: 12 cubes | |
| **Extension** | |
| Encourage students to discuss the language they will use to describe different parts of their shape with their partner first, so that when writing or giving instructions they are consistent in style.  Example of instructions: Use 16 cubes. The bottom layer of my shape is made with 8 cubes in 2 rows of 4 cubes. The second layer is made with 4 cubes that are in 2 rows of 2 cubes in the middle of the shape. The third layer is the same as the second layer. | |

**Measures:** Length

**23. Snails’ Trails**

This task encourages students to think about measuring lengths and exploring ways of measuring lengths using non-standard units of measurement.

**Focus Skills:**

* *Applying and problem-solving*: Select appropriate materials and processes for mathematical tasks and applications.
* *Communicating and Expressing*:Listen to and discuss other children’s mathematical descriptions and explanations.
* *Reasoning*: Justify the processes and results of mathematical activities.

**Teaching Points:**

* Ask students to look at the snails’ trails and describe what they notice.
* As part of the first Maths Talk aspect of the lesson, encourage students to explore and brainstorm ways they can measure the different lines.
* While brainstorming ways to measure, encourage students to consider why different ways of measuring would be: (a) a good idea (b) challenging or (c) not appropriate. Students may suggest cubes, pencils, matchsticks, string or other items found in the classroom, as appropriate tools for measuring.
* As a class, explore the need to use the same measurement tool for each line and discuss – *Why is using the same measuring tool important? What information could it tell us?*
* Discuss what estimate means. Encourage the children to explain their understanding of this word – *What purpose does an estimate have?*
* In the second Maths Talk aspect, students are encouraged to compare their answers. If students have used similar items as measuring tools and there are differences in measured length, encourage them to reason why this may have occurred. If their answers are all similar, encourage them to explain to their partner how they went about measuring – *What top tips would you give to a friend when measuring the snail trails?*
* In Part B, students will need to identify which of the snails’ trails were the longest and shortest. They should be able to do this by comparing the lengths they recorded in their tables in Part A. Encourage students to prove that their trail is either longer or shorter than the corresponding trail on page 50.

**Anticipated Student Responses:**

|  |  |
| --- | --- |
| **Part A** | **Part B** |
| Length will vary according to each student’s choice of measurement tool. | L will be longer than Snail Trail E.  S will be shorter than Snail Trail B. |
| **Extension** | |
| Student’s choice. Encourage them to think about how it will look different and how they know it is the exact same size as one of the trails from Part A. | |

**Data:** Representing and Interpreting Data

**30. Bring Your Pet to School Day**

This task encourages students to apply their understanding of data and number in a problem-solving context.

The aim of this activity is to encourage students to record the different possible data collections by exploring the possible addition combinations to make up the given number of 16.

**Focus Skills:**

* *Applying and problem-solving*: Apply concepts and processes in a variety of contexts.
* *Communicating and expressing*: Discuss and record the results of mathematical activities using diagrams, pictures and symbols.
* *Integrating and connecting*: Connect informally acquired mathematical ideas with formal mathematical ideas.

**Teaching Points:**

* Read the first part of the problem with the class. Encourage students to think about what type of pets the children in 1st Class could have, drawing on their own personal experience – *What type of pets do you or your friends have at home? How many legs do these pets have?*
* Make a list of possible pets and their leg count on the whiteboard.
* Emphasise that there is more than one answer and that students should try to find as many possible solutions as they can.
* Encourage students to spend time talking about the problem with a partner or small group – *How are you going to get started? How are you going to record your answers?*
* Ask students to have a look at the graph in Part B. Ask questions such as – *What do you think we have to do here?* Encourage the students to explain how they will display their data on the graph.
* Encourage students to use initials for their pets, e.g. C for cats and D for dogs. If there are pets that begin with the same letter, encourage them to think of a suitable abbreviation. Explain that they are using a code. Students may like to illustrate pictures at the side of their graph for their code. It is important that students can recall what each symbol is in order to explain their graph to a friend.
* Talk about the role of colour when completing the pictogram. Animals could be colour coded to help show the different type of animals.
* Some students may benefit from additional support. Give out small pieces of paper or card and ask the students to draw one pet per piece of paper/card. Encourage them to focus on the number of legs, continue to draw pets on cards until they reach 16 legs. These cards could then be physically combined to help them show their solutions on the graph.
* Encourage students to explore the different possibilities of this problem, prompt the students to combine and partition numbers in a real-life context. It is likely that 4 pets will be the most obvious answer. Students might choose to explore this by using different types of four-legged animals. Ask them to explain how they know their answer is correct. This helps to consolidate their thinking. Ask questions such as –

*I wonder is there any way we could have less animals?; I wonder is there any way we could have more animals*? This may help to open their thinking to different number stories.

* In Maths Talk aspect of the lesson, encourage students to draw on the similarities and differences. This will help foster students’ understanding that there are many possible solutions to this question.

**Anticipated Student Responses:**

|  |  |
| --- | --- |
| **Part A** | **Part B** |
| 2 pets (8 + 8)  3 pets (8 + 4 + 4)  4 pets (4 + 4 + 4 + 4)  5 pets (4 + 4 + 4 + 2 + 2)  6 pets (4 + 4 + 2 + 2 + 2 + 2)  7 pets (4 + 2 + 2 + 2 + 2 + 2 + 2)  8 pets (2 + 2 + 2 + 2 + 2 + 2 + 2 + 2)  9 pets(2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 0\*)  **Pet ideas:**  Eight-legged pets: spiders  Four-legged pets: cat, dog, guinea pig, rabbit, turtle  Two-legged pets: cockatoos, parrots, canaries  \*Zero-legged pets: snakes, fish (the question is open for all interpretations) | Students choose how they will display their answers on a graph. Encourage them to explain how their graph correctly displays their chosen data. |
| **Extension** | |
| Possible answers are:  Any combination of 5 four-legged pets (5 cats / 5 dogs / 5 guinea pigs / 5 rabbits / 5 turtles or 1 each of cat / dog / guinea pig / rabbit / turtle)  spider (8), cat (4), dog (4), parrot (2), cockatoo (2)  spider (8), cat (4), dog (4), turtle (4), snake (0) | |